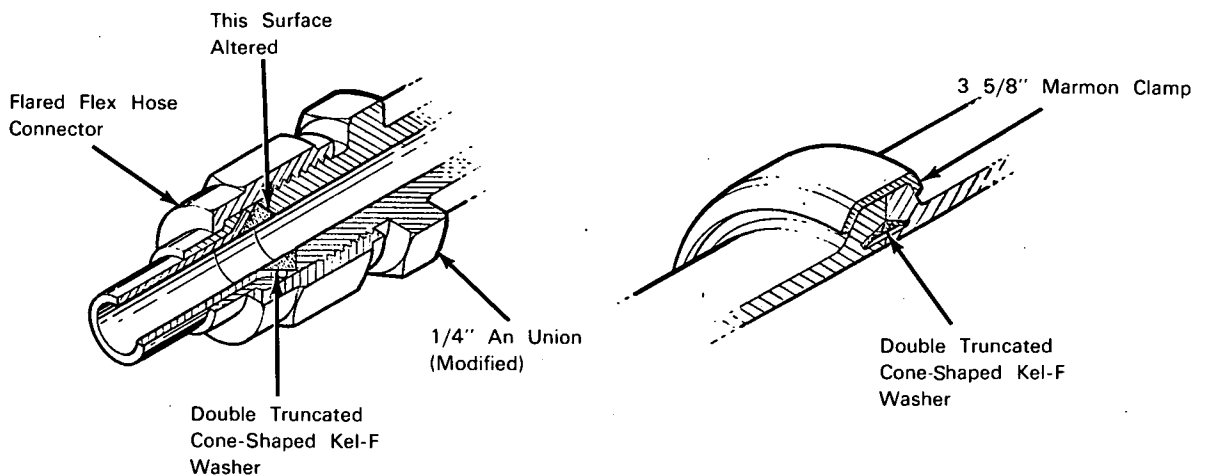


NASA TECH BRIEF



NASA Tech Briefs are issued to summarize specific innovations derived from the U.S. space program, to encourage their commercial application. Copies are available to the public at 15 cents each from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

Hand-Tightened, High-Pressure Seal



The problem:

A need existed to provide flared tubing and hose connections for high-pressure (10,000 psi) cryogenic service that could be assembled without the use of tools.

The solution:

Modify existing high-pressure fittings to provide hand-tightened, leak-proof connections.

How it's done:

A 1/4-inch male AN union was modified by machining to receive a special, double-truncated-cone-shaped Kel-F washer between it and the flared flex hose connector as shown in the left figure. This modified fitting with the insert can be hand tightened.

The insert design provides sufficient compression of the Kel-F material to allow a metal-to-metal fit between the flared tube and the AN union. Tests were conducted at 10,000 psi, ambient temperature, and at 3000 psi, -320°F , using liquid nitrogen. These tests were conducted with fittings tightened by various per-

sonnel having different hand strengths. All tests were successful, and no leakage was experienced.

A 3-5/8-inch-diameter, double-truncated-cone-shaped seal, used in conjunction with a Marmon clamp modified with wing nuts, as shown in the right figure, was successfully tested at room temperature, but leaked excessively at -320°F . Total shrinkage of a Kel-F seal for a given diameter and temperature can be computed by subtracting from the diameter the product of the constant K and the diameter. From these computations, it can be determined that the seal will shrink 0.034437 inch at -320°F , which is more than the compressibility of the material. Therefore, a leak would be expected at that temperature. Conversely, at a 0.750-inch diameter, the seal will shrink 0.007125 inch. Compressibility of the material is greater than the shrinkage at this temperature, and a sealed fitting without leakage can be achieved.

The use of this type of hand-tightened seal, for use on cryogenic lines to -320°F , is limited to seal diameters of 3/4 inch and less. Indications are that there

(continued overleaf)

would be no limit to the size of this seal design, for use at ambient temperature.

Notes:

1. Areas in which this type of fitting and seal could be used to advantage are (1) laboratory instrumentation, (2) flow bench hookups, and (3) hydraulic connections.
2. No additional documentation for this invention is available.
3. Questions concerning this invention may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B68-10417

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Wilbur A. Meyer
of North American Rockwell Corporation
under contract to
Marshall Space Flight Center
(MFS-18416)